

## REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the above amendments and the following remarks.

Claims 21 has been amended to incorporate the subject matter of claim 24, claim 25 has been amended to incorporate the subject matter of claim 26, claim 27 has been amended to incorporate the subject matter of claim 28, claims 24, 26, and 28 have been cancelled, and claim 22 has been amended to remove the recited reference characters. Since the amendments to the claims incorporate dependent claims into the independent claims, the amendments to the claims raise no new issues and entry thereof under 37 CFR 1.116 is warranted. Support for the amendments to the claims is found, for example, in the cancelled claims and in the description of the first embodiment (see, e.g., paragraphs [0085]-[0110] and FIG. 8 of the published U.S. application). No new matter is added.

Claims 21-23, 25, 27 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Okumura et al. (US 2002/0094011 A1) (hereinafter, “Okumura”) in view of Hwang et al. (US 2003/0108013 A1) (hereinafter, “Hwang”). Claims 24, 26, and 28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Okumura in view of Hwang and further in view of Sibecas (US 2004/0128605) (hereinafter, “Sibecas”). To the extent that these rejections are deemed applicable to the amended claims, the Applicants respectfully traverse based on the points set forth below.

As described in the Background section of the present specification, it is desirable to control pilot densities according to a propagation environment. Without controlling pilot densities, if information on a subcarrier to insert into a pilot symbol is transmitted as feedback

every time, the amount of control information becomes enormous, which constricts the channel capacity. (See published U.S. application, par. [0008]).

To overcome these and others problems associated with the prior art, the transmitting apparatus recited by claim 21 (which has been amended to incorporate the features of dependent claim 24) employs a configuration having the following features:

“21. A transmitting apparatus that transmits pilot signals to a plurality of user equipments, the transmitting apparatus comprising:

a generator configured to generate a signal including pattern information indicating which pilot pattern among at least two pilot patterns is respectively assigned to each time slot of a plurality of time slots, each of the pilot patterns representing mutually different arrangement densities of pilot signals in at least one of a frequency domain and a time domain, at least two of the time slots being assigned different pilot patterns from among the pilot patterns; and

a transmitter configured to broadcast the signal to the plurality of user equipments, and to transmit the pilot signals according to the pilot patterns respectively assigned to the time slots.” (emphasis added)

In the rejection of claim 24, the Office Action (pg. 4) alleges:

“Referring to claim 24, the combination of Okumura/Hwang discloses the transmitting apparatus according to claim 21.

The combination does not specifically disclose different pilot patterns are mutually different arrangement densities of the pilot signals in at least one of a frequency domain and a time domain.

Sibecas discloses pilot different pilot patterns are mutually different arrangement densities of the pilot signals in at least one of a frequency domain and a time domain (Par. 51, “patterns with higher density patterns,” “lower density of pilot symbols,” note that pilot signals have low or high density patterns or higher density patterns, thus, they would be of different density arrangements).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the combination in the format, for the purpose of providing an efficient signaling system system.”

However, despite the allegations set forth in the Office Action, Sibecas fails to teach

these above-noted features of claim 21, and none of the other references cure this deficiency of Sibecas.

In contrast to the transmitting apparatus recited by claim 21, Sibecas discloses using pilot symbols of high density when high-speed Doppler effects are anticipated or detected, and using pilot symbols of low density when low-speed Doppler effects are anticipated or detected (paragraph [0051]). Specifically, paragraph [0051] of Sibecas (which the Office Action relies on) discloses:

“[0051] The linear pattern of pilot symbols shown in FIGS. 3, 4 and 5 should not be considered limiting since many other patterns of pilot symbols could be used. Moreover, although there is preferably only a single pilot symbol substitution per symbol interval (as illustrated), this should also not be considered limiting since the boundary is determined by how many and what type of errors can be tolerated by the error correction encoding and decoding system in use along with the channel conditions being addressed. Since the substitution of pilot symbols for OFDM data introduces errors, it may be desirable to minimize the number of pilot symbols used under a given set of circumstances. In one embodiment, the pilot symbol pattern can be selected from a palette of pilot symbol patterns either in accordance with a random selection process or in accordance with a selection process based upon any suitable criterion. By way of example, and not limitation, patterns with higher density of pilot symbols can be selected when high-speed Doppler effects are anticipated or detected, and lower density of pilot symbols used when lower speed Doppler effects are anticipated or detected. In other examples, the pilot symbol pattern can be selected and refined to achieve optimal performance in a given environment, based upon a receiver’s error rate or some other criteria. Simulation results have shown that even randomly selected pilot patterns (within the constraints of  $M_f$  and  $M_t$  above) can provide significant improvement over the standard IEEE 802.11a pilot structure.”

However, the mere disclosure of using pilot symbols of high density when high-speed Doppler effects are anticipated or detected and using pilot symbols of low density when low-speed Doppler effects are anticipated or detected, as disclosed by Sibecas, is not the same as, and does not suggest, the subject matter of “each of the pilot patterns representing mutually different arrangement densities of pilot signals in at least one of a frequency domain and a time domain,” as recited by the Applicants’ claim 21. Sibecas does not mention pilot patterns representing

“mutually different arrangement densities,” and further does not mention a “frequency domain and a time domain,” as recited by the Applicants’ claim 21.

Furthermore, the transmitting apparatus recited by claim 21 employs a configuration for broadcasting, “to a plurality of user equipments,” “a signal including pattern information indicating which pilot pattern among at least two pilot patterns is respectively assigned to each time slot of a plurality of time slots, each of the pilot patterns representing mutually different arrangement densities of pilot signals in at least one of a frequency domain and a time domain, at least two of the time slots being assigned different pilot patterns from among the pilot patterns.” In contrast, as is clear from FIG. 11, Sibecas relates to a technique of reporting a pilot structure individually from an access point to a single mobile unit. (See also Sibecas, paragraph [0063], disclosing “[t]he access point identifies the correct pilot structure at 416 and sets the assigned service data bits to tell the mobile unit which pilot structure is being used at 420”). Therefore, Sibecas corresponds to the conventional technique of constricting the channel capacity, as described in the description of the prior art of the present application. As a result, the technique disclosed by Sibecas would suffer from the same problems as the problems caused by the prior art techniques identified in the present application, and clearly does not disclose the above-noted features recited by claim 21. Therefore, despite the allegations set forth in the Office Action, Sibecas fails to disclose at least the above-noted features of the transmitting apparatus recited by claim 21, fails to achieve the same benefits as the transmitting apparatus recited by claim 21, and teaches away from the unique configuration recited by claim 21. (See MPEP 2145 (X)(D)(1)).

Accordingly, it is respectfully submitted that the rejection of claim 21 should be withdrawn for at least this reason.

Also, Okumura discloses “a pilot symbol generator for generating pilot symbols of a

known pattern periodically” (paragraph [0071]). However, despite the allegations set forth in the Office Action, Okumura fails to teach or suggest at least the recited features of “pattern information indicating which pilot pattern among at least two pilot patterns is respectively assigned to each time slot of a plurality of time slots, each of the pilot patterns representing mutually different arrangement densities of pilot signals in at least one of a frequency domain and a time domain, at least two of the time slots being assigned different pilot patterns from among the pilot patterns,” as recited by the Applicants’ claim 21. Paragraph [0071] of Okumura does not even mention “pattern information,” or respectively assigning “pilot patterns” to time slots based on the pattern information, as recited by the Applicants’ claim 21. Furthermore, FIG. 8’s mere disclosure of “time slots” fails to teach or suggest this above-noted feature of claim 21. Moreover, Okumura fails to disclose anything equivalent to a configuration for broadcasting such “pattern information” to a “plurality of user equipments,” as recited by the Applicants’ claim 21.

Accordingly, it is respectfully submitted that the rejection of claim 21 should be withdrawn for at least this reason as well.

Moreover, despite the allegations set forth in the Office Action, Hwang fails to teach or suggest the feature of “at least two of the time slots being assigned different pilot patterns from among the pilot patterns,” as recited by the Applicants’ claim 21. Paragraph [0056] of Hwang (which the Office Action relies on) discloses the following:

“The pilot field 805 is a field for estimating the channel condition and received signal intensity of the S\_UL\_DPCCH. The pilot pattern used in the UL\_DPCCH may be reused, and the simplest pattern of all one sequence may be transmitted by a presetting between the node B and UE. Further, a pattern different from the pilot pattern in the UL\_DPCCH may be transmitted. Also, a pilot field with the same pattern may be transmitted for each slot, or different pilot patterns may be used in order to configure the order of the slots. Preferably, a value preset between the node B and the UE is employed regardless of the pilot pattern to

estimate the signal intensity and uplink transmission channel condition of the S\_UL\_DPCCH. If a value, which is not preset, is transmitted, only the intensity of the pilot signal of the S\_UL\_DPCCH can be measured. This may cause some deterioration in performance.”

However, as is clear from the description of “the simplest pattern of all one sequence,” the “pilot pattern” of Hwang means a pattern multiplying a pilot signal by a “sequence.” This disclosure differs from the feature of “at least two of the time slots being assigned different pilot patterns from among the pilot patterns,” as recited by the Applicants’ claim 21. Furthermore, although Hwang discloses “a value preset between the node B and the UE is employed,” Hwang does not describe that the value is shared among the node B and the UE. Thus, Hwang fails to teach or suggest “pattern information indicating which pilot pattern among at least two pilot patterns is respectively assigned to each time slot of a plurality of time slots, each of the pilot patterns representing mutually different arrangement densities of pilot signals in at least one of a frequency domain and a time domain, at least two of the time slots being assigned different pilot patterns from among the pilot patterns,” and further fails to teach or suggest a configuration of broadcasting such “pattern information” to a “plurality of user equipments.”

Accordingly, the Applicants submit that even if the teachings of Okumura, Hwang and Sibecas were combined as proposed in the Office Action, the combination would still lack the above-noted features of claim 21 and thus these references, considered individually or in combination, do not render obvious the subject matter now defined by claim 21. Independent claims 25 and 27 now similarly recite the above-mentioned subject matter distinguishing apparatus claim 21 from Okumura, Hwang and Sibecas, although claim 25 does so with respect to a method, and claim 27 does so with respect to an integrated circuit. Therefore, allowance of claims 21, 25 and 27 and all claims dependent therefrom is considered to be warranted.

In view of the above, it is submitted that this application is in condition for allowance and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

/James Edward Ledbetter/

Date: December 7, 2010  
JEL/DEA/att

James E. Ledbetter  
Registration No. 28,732

Attorney Docket No. 009289-06106  
Dickinson Wright PLLC  
1875 Eye Street, NW, Suite 1200  
Washington, DC 20006  
Telephone: (202) 457-0160  
Facsimile: (202) 659-1559

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